



## **QUARTERLY GROUNDWATER MONITORING REPORT**

**Second Quarter 2005 (Twelfth Quarterly)**

**Sampled on April 14, 2005**

**Job # SP-165**

**LOP # 1TDN059**

### **Crescent Shell**

890 L Street

Crescent City, California 95531

June 28, 2005

This *Quarterly Groundwater Monitoring Report* was prepared by SounPacific Environmental Services (SounPacific) staff for Big Oil & Tire Co. (BO&T). This report documents the results of the 12th sampling event of the site's groundwater monitoring wells. This report includes data from previous studies that were conducted by Clearwater Group, Inc. (CGI) and file review conducted at Del Norte County Department of Environmental Health (DNCDEH). The station is located at 890 L Street, Crescent City, California (Figure 1).

### **SITE DESCRIPTION**

The site is located in downtown Crescent City, at the corner of Ninth and L Streets in Crescent City, California. L Street is used as the southbound lane of U.S. Highway 101. The lot remains vacant while the owner continues to investigate the lateral and vertical extent of contamination. Drainage is controlled by culverts that flow towards the ocean. Sewer and water services are supplied by public utilities (Figure 2).

## **SITE TOPOGRAPHY AND LAND USE**

SounPacific understands that BO&T currently owns the property. The site is a vacant lot. The site topography is relatively flat with the surrounding topography consisting of terrain that descends in an east to southeasterly direction (Figure 1). The surrounding vicinity includes a collection of commercial and residential properties. Skagg Auto Repair lies adjacent to the southwest property line. Various residential properties border the southeastern side of the site, and L Street and Ninth Street run along the northwest and northeast sides of the property, respectively. The former Crescent Shell site is located within one mile of the Pacific Ocean as shown on Figure 1. A review of county records indicated that there is an ongoing investigation directly to the northeast of the site across L Street.

## **RESULTS OF QUARTERLY SAMPLING**

A groundwater-monitoring program was implemented at the site in May 2002 for wells MW-1 and MW-2, and expanded to MW-4, MW-5, MW-6, and MW-7 on April 22, 2003, following their installation. An additional monitoring well MW-8 was installed on March 4, 2005. The current monitoring program will continue until further notice. The program consists of recording quarterly water level data and collecting quarterly groundwater samples for laboratory analysis. Water level data is used to develop a figure which displays the groundwater gradient and average flow direction using standard three-point calculations. Analytical results from groundwater samples collected from the monitoring wells during quarterly sampling events present hydrocarbon contamination levels in the groundwater beneath the site. Monitoring wells were gauged and sampled on April 14, 2005.

### **FIELD DATA**

<b>Wells gauged:</b>	MW-1, MW-2, MW-4, MW-5, MW-6, MW-7 and MW-8
<b>Groundwater:</b>	Ranged from 30.56 to 33.18 feet above mean sea level (Table 1)
<b>Floating product:</b>	Sheen detected in MW-1, MW-2, MW-5 and MW-8
<b>Flow Direction:</b>	ESE (Figure 3)
<b>Groundwater gradient:</b>	0.02 feet per foot (Figure 3)

On April 14, 2005, the depth to groundwater in the site's seven monitoring wells ranged from 3.60 feet below top of casing (btoc) in well MW-1 to 7.32 feet btoc in MW-8. When corrected to mean sea-level, water level elevations ranged from 30.56 feet above mean sea-level (amsl) to in MW-8 to 33.18 feet amsl in MW-1. Groundwater levels for the April 14, 2005 monitoring event, along with historical level and elevations are included in Table 1. Groundwater flow on April 14, 2005 was towards the east-southeast at a gradient of 0.02 feet per foot. This flow direction and gradient are similar to the previous monitoring event's flow direction and gradient. The groundwater flow and gradient are graphically depicted in Figure 3. Prior to sampling, all wells were purged; the groundwater field parameters for each well are presented below.

#### **MONITORING WELL MW-1 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
3:42	0	7.11	58.30	0.610
3:47	1.57	6.79	58.29	0.607
3:50	3.14	7.02	58.69	0.660
3:55	4.71	6.74	58.72	0.639

#### **MONITORING WELL MW-2 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
5:22 pm	0	7.08	57.38	0.262
5:25	1.31	7.19	57.94	0.249
5:28	2.62	7.18	58.08	0.241
5:31	3.93	7.15	58.11	0.244

**MONITORING WELL MW-4 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
4:22 pm	0	7.62	60.47	0.177
4:27	2.26	7.56	59.96	0.178
4:30	4.56	7.60	59.98	0.177
4:33	6.78	7.59	60.02	0.177

**MONITORING WELL MW-5 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
4:52 pm	0	7.51	58.90	0.178
4:56	2.2	7.47	59.45	0.192
4:59	4.4	7.41	59.53	0.193
5:03	6.6	7.31	59.59	0.196

**MONITORING WELL MW-6 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
5:46 pm	0	7.44	55.69	0.103
5:51	1.95	7.46	56.29	0.108
5:54	3.80	7.43	56.41	0.115
5:58	5.75	7.40	56.49	0.116

**MONITORING WELL MW-7 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
3:04 pm	0	7.70	56.56	0.147
3:10	2.32	7.49	56.47	0.169
3:13	4.64	7.39	56.56	0.175
3:19	6.96	7.30	56.75	0.178

### **MONITORING WELL MW-8 GROUNDWATER FIELD PARAMETERS**

<b>Time</b>	<b>Total Vol. Removed/ gal</b>	<b>pH</b>	<b>Temp./ F</b>	<b>Cond./ ms(cm)<sup>-1</sup></b>
6:17 pm	0	7.24	56.38	0.187
6:22	1.1	7.47	57.14	0.269
6:24	2.2	7.68	57.17	0.263
6:26	3.9	7.88	57.25	0.286

### **ANALYTICAL RESULTS**

**Sampling locations:** MW-1, MW-2, MW-4, MW-5, MW-6, MW-7 and MW-8

**Analyses performed:** TPHg, BTXE, MTBE, DIPE, TAME, ETBE, TBA, TPHd, TPHmo

**Laboratories Used:** Basic Labs, Redding, California

The analytical results for the current monitoring event are presented below and graphically depicted in Figure 4. The laboratory report is included as Appendix A. The historical analytical results for all monitoring wells, since the implementation of groundwater monitoring are included as Table 2.

	<u>MW-1</u>	<u>MW-2</u>	<u>MW-4</u>	<u>MW-5</u>	<u>MW-6</u>	<u>MW-7</u>	<u>MW-8</u>
	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
<b>TPHg:</b>	<b>16,300</b>	<b>10,300</b>	ND < 50	<b>19,200</b>	ND < 50	ND < 50	<b>5,710</b>
<b>Benzene:</b>	ND < 10	ND < 5.0	ND < 0.5	<b>5.2</b>	ND < 0.5	ND < 0.5	<b>785</b>
<b>Toluene:</b>	<b>4,770</b>	<b>5,100</b>	ND < 0.5	<b>9,270</b>	ND < 0.5	ND < 0.5	<b>614</b>
<b>Xylenes:</b>	<b>57.6</b>	<b>12.1</b>	ND < 1.0	<b>13.2</b>	ND < 1.0	ND < 1.0	<b>653</b>
<b>Ethylbenzene:</b>	<b>1,990</b>	<b>5.7</b>	<b>0.7</b>	<b>3.8</b>	ND < 0.5	ND < 0.5	<b>680</b>
<b>MTBE:</b>	ND < 20.0	ND < 10.0	ND < 1.0	ND < 5.0	ND < 1.0	ND < 1.0	ND < 12.5
<b>DIPE:</b>	ND < 10.0	ND < 5.0	ND < 0.5	ND < 2.5	ND < 0.5	ND < 0.5	ND < 6.2
<b>TAME:</b>	ND < 10.0	ND < 5.0	ND < 0.5	ND < 2.5	ND < 0.5	ND < 0.5	ND < 6.2
<b>ETBE:</b>	ND < 10.0	ND < 5.0	ND < 0.5	ND < 2.5	ND < 0.5	ND < 0.5	ND < 6.2
<b>TBA:</b>	ND < 1,000	ND < 500	ND < 50	ND < 250	ND < 50	ND < 50	ND < 625
<b>TPHd:</b>	<b>8,340</b>	<b>128,000</b>	<b>303</b>	<b>23,300</b>	<b>183</b>	<b>150</b>	<b>40,600</b>
<b>TPHmo:</b>	<b>1,830</b>	<b>39,800</b>	<b>132</b>	<b>7,290</b>	<b>94</b>	<b>140</b>	<b>12,300</b>

ND = non-detectable

## COMMENTS AND RECOMMENDATIONS

On April 14, 2005, the 12<sup>th</sup> groundwater monitoring event for the three on-site monitoring wells and four (4) off-site monitoring wells was conducted at the Crescent Shell at 890 L Street in Crescent City, California. A summary of the results are presented below.

- The depth to groundwater ranged between 3.60 feet btoc to 7.32 feet btoc. Groundwater flow was towards the East-Southeast at a gradient of 0.02 feet per foot.
- Groundwater samples were collected and analyzed for TPHg, BTXE, five-fuel oxygenates, TPHd, and TPHmo,. Laboratory results reported TPHg in four of the seven wells at concentrations ranging between 5,710 ppb (MW-8) and 19,200 ppb (MW-5). Benzene was reported in two wells at concentrations of 5.2 ppb (MW-5) and 785 ppb (MW-8). Toluene was reported in four wells at concentrations ranging

between 614 ppb (MW-8) and 9,270 ppb (MW-5). Xylenes were reported in four wells at concentrations ranging between 12.1 ppb (MW-2) and 653 ppb (MW-8). Ethylbenzene was reported in five wells at concentrations ranging between 0.7 ppb (MW-4) and 1,990 ppb (MW-1). TPHd was reported in seven wells at concentrations ranging from 150 ppb (MW-7) to 128,000 ppb (MW-2). TPHmo was reported in seven wells at concentrations ranging between 94 ppb (MW-6) and 39,800 ppb (MW-2). No fuel oxygenates were reported.

Based upon these results the following observations and conclusions have been made.

- TPHg concentrations have doubled in wells MW-1 and MW-2 since the last sampling event. TPHg has consistently been reported in wells MW-1, MW-2, and MW-5 at fluctuating concentrations. TPHg was detected in well MW-8 during the second quarter of 2005 following the installation on March 4, 2005. In the remaining wells TPHg was reported at levels slightly above the reporting limit only once in each well since the introduction of the groundwater monitoring. The historical fluctuations of TPHg concentrations over time for all wells are shown in Figures 5 through 10.
- TPHd concentrations have increased significantly since the last sampling event in all wells. TPHd has consistently been reported in wells MW-1 and MW-2 since the inception of the monitoring, except during the first quarter of 2004. In well MW-5, TPHd was reported during the well installation sampling event and the second quarter of 2005. In wells MW-4, MW-6, and MW-7, TPHd was reported for the first time (second quarter 2005) since the inception of the monitoring. In well MW-8, TPHd was reported during the second quarter of 2005 at a level significantly higher than the reporting limit. The historical fluctuations of TPHd concentrations over time for all wells are shown in Figures 5 through 10.
- TPHmo concentrations have increased significantly since the last sampling event in all wells. TPHmo was only reported in well MW-1 in the second quarter of 2002 and the

second quarter of 2005. In the remaining wells, TPHmo was detected in each well only during the second quarter of 2005.

- BTXE had not been reported in well MW-4 with an exception during the twelfth quarterly sampling event. In wells MW-6 and MW-7, with the exception of a single report of ethylbenzene, just above the reporting limit, during the tenth quarterly monitoring event, BTXE compounds have never been reported. The historical fluctuations of BTXE concentrations over time for all wells are shown in Figures 5 through 8.
- With the exception of the twelfth quarterly monitoring event in MW-2, Benzene has been detected in wells MW-2 and MW-5 consistently since the inception of the monitoring. Benzene was detected in well MW-1 in five of the last thirteen sampling events. Benzene was also detected in well MW-8 during the second quarter of 2005.
- Toluene was detected in MW-1 in seven of the last thirteen sampling events. Toluene was detected in MW-2 in six of the last thirteen sampling events and in MW-5 during five of the last nine sampling events. Toluene was also detected in MW-8 during the second quarter of 2005.
- Xylenes were consistently detected in MW-1 during twelve of the last thirteen sampling events. Xylenes were detected in MW-2 in seven of the last thirteen sampling events and were consistently detected in MW-5 except during the first quarter 2004 when the non-detect levels were reported. Xylenes were also detected in well MW-8 during the second quarter of 2005.
- Ethylbenzene was detected in wells MW-1, MW-2 and MW-5 consistently since the inception of the monitoring. Ethylbenzene was detected in well MW-4 for the first time

during the second quarter of 2005. Ethylbenzene was detected once in wells MW-6 and MW-7 during the fourth quarter 2004 at levels slightly higher than the reporting limits. Ethylbenzene was also detected in well MW-8 during the second quarter of 2005.

- MTBE was reported once in well MW-1 (349 ppb) during the fourth quarter 2002 and once in well MW-4 (0.7 ppb) during the well installation sampling event. MTBE has never been reported at any other time in any wells.

Based on the results of the April 2005 monitoring event and historical results, the following future activities are proposed.

- Groundwater monitoring will be continued until further notice. Groundwater level measurements will be collected from the three on-site and the four off-site monitoring wells to determine groundwater flow direction and gradient. Collected groundwater samples will be analyzed for TPHg, BTXE, five-fuel oxygenates/additives, TPHd, and TPHmo.
- Hydrocarbon concentrations have increased significantly in all wells since the last sampling event. Monitoring well MW-5 reported the highest TPHg concentrations during the recent sampling since the inception of the monitoring. TPHd and TPHmo concentrations were reported for the first time in wells MW-6 and MW-7 since the inception of the monitoring. Based on these elevated levels in the groundwater at this site and historical analytical data, SounPacific has determined that remedial action is necessary for the sufficient clean-up of this site. Proposed remedial alternatives will be recommended in the Report of Findings for the recent subsurface investigation, which is currently being prepared and will be submitted in September 2005.

## CERTIFICATION

This report was prepared under the direct supervision of a California registered geologist at SounPacific. All information provided in this report including statements, conclusions and recommendations are based solely upon field observations and analyses performed by a state-certified laboratory. SounPacific is not responsible for laboratory errors.

SounPacific promises to perform all its work in a manner that is currently used by members in similar professions working in the same geographic area. SounPacific will do whatever is reasonable to ensure that data collection is accurate. Please note however, that rain, buried utilities, and other factors can influence groundwater depths, directions and other factors beyond what SounPacific could reasonably determine.

SounPacific

Prepared by:



Greg Sounhein, REA # 07994

Project Manager



Reviewed by:



Michael Sellens, RG # 4714, REA # 07890

Principal Geologist



## **ATTACHMENTS**

### **TABLES & CHARTS**

Table 1:	Water Levels
Table 2:	Groundwater Analytical Results
Chart 1:	Hydrograph

### **FIGURES**

Figure 1:	Aerial/Topo Map
Figure 2:	Site Plan
Figure 3:	Groundwater Gradient Map April 2005
Figure 4:	Groundwater Analytical Results
Figure 5:	MW-1 Hydrocarbon Concentrations vs. Time
Figure 6:	MW-2 Hydrocarbon Concentrations vs. Time
Figure 7:	MW-4 Hydrocarbon Concentrations vs. Time
Figure 8:	MW-5 Hydrocarbon Concentrations vs. Time
Figure 9:	MW-6 Hydrocarbon Concentrations vs. Time
Figure 10:	MW-7 Hydrocarbon Concentrations vs. Time

### **APPENDICES**

Appendix A:	Laboratory Report and Chain-of-Custody Form
Appendix B:	Standard Operating Procedures
Appendix C:	Field Notes

# Tables & Chart

**Table 1**  
**Water Levels**  
Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Date	Depth to Bottom/ Feet BGS	Survey Height/ Feet Above MSL	Depth to Water/ Feet BGS	Adjusted Elevation/ Feet Above MSL	Thickness of Floating Product/ Feet	Corrected Adjusted Elevation/ feet Above MSL
MW-1	5/6/2002	13.41	36.78	7.70	29.08	----	----
	8/4/2002	13.44	36.78	9.88	26.90	----	----
	11/6/2002	13.42	36.78	11.69	25.09	----	----
	2/7/2003	13.47	36.78	3.97	32.81	----	----
	4/22/2003	13.65	36.78	3.82	32.96	----	----
	5/22/2003	13.65	36.78	5.64	31.14	SHEEN	----
	6/26/2003	13.65	36.78	8.01	28.77	0.01	28.77
	7/22/2003	13.65	36.78	9.00	27.78	0.00	27.78
	8/25/2003	13.65	36.78	9.92	26.86	0.00	26.86
	9/22/2003	13.65	36.78	10.51	26.27	0.00	26.27
	10/23/2003	13.65	36.78	11.11	25.67	0.00	25.67
	11/25/2003	13.65	36.78	10.63	26.15	0.00	26.15
	12/16/2003	13.65	36.78	7.41	29.37	0.00	29.37
	1/23/2004	13.65	36.78	4.41	32.37	0.00	32.37
	2/24/2004	13.65	36.78	2.60	34.18	0.00	34.18
	3/26/2004	13.65	36.78	4.51	32.27	0.00	32.27
	4/29/2004	13.65	36.78	5.75	31.03	0.00	31.03
	7/30/2004	13.68	36.78	9.94	26.84	0.00	26.84
	11/2/2004	13.67	36.78	10.39	26.39	0.00	26.39
	1/30/2005	13.40	36.78	6.76	30.02	0.00	30.02
	4/14/2005	13.39	36.78	3.60	33.18	0.00	33.18
MW-2	5/6/2002	13.48	37.20	9.25	27.95	----	----
	8/4/2002	13.49	37.20	11.24	25.96	----	----
	11/6/2002	13.50	37.20	12.90	24.30	----	----
	2/7/2003	13.52	37.20	6.38	30.82	----	----
	4/22/2003	13.41	37.20	6.33	30.87	----	----
	5/22/2003	13.41	37.20	7.74	29.46	0.00	29.46
	6/26/2003	13.41	37.20	9.58	27.62	0.00	27.62
	7/22/2003	13.41	37.20	10.43	26.77	0.00	26.77
	8/25/2003	13.41	37.20	11.26	25.94	0.00	25.94
	9/22/2003	13.41	37.20	11.8	25.40	0.00	25.4
	10/23/2003	13.41	37.20	12.35	24.85	0.00	24.85
	11/25/2003	13.41	37.20	12.83	24.37	0.00	24.37
	12/16/2003	13.41	37.20	7.89	29.31	0.00	29.31
	1/23/2004	13.41	37.20	6.69	30.51	0.00	30.51
	2/24/2004	13.41	37.20	4.37	32.83	0.00	32.83
	3/26/2004	13.41	37.20	6.33	30.87	0.00	30.87
	4/29/2004	13.41	37.20	7.65	29.55	0.00	29.55
	7/30/2004	13.74	37.20	11.27	25.93	0.00	25.93
	11/2/2004	13.43	37.20	11.55	25.65	0.00	25.65
	1/30/2005	13.75	37.20	8.37	28.83	0.00	28.83
	4/14/2005	13.77	37.20	5.58	31.62	0.00	31.62
MW-4	4/22/2003	18.92	36.86	5.20	31.66	----	----
	5/22/2003	18.91	36.86	6.74	30.12	0.01	30.13
	6/26/2003	18.92	36.86	9.64	27.22	0.01	27.23
	7/22/2003	18.92	36.86	9.51	27.35	0.01	27.36
	8/25/2003	18.92	36.86	10.38	26.48	0.01	26.49
	9/22/2003	18.92	36.86	10.94	25.92	0.00	25.92
	10/23/2003	18.92	36.86	11.52	25.34	0.00	25.34
	11/25/2003	18.92	36.86	11.04	25.82	0.00	25.82
	12/16/2003	18.92	36.86	8.05	28.81	0.00	28.81
	1/23/2004	18.92	36.86	5.65	31.21	0.00	31.21
	2/24/2004	18.92	36.86	3.82	33.04	0.00	33.04
	3/26/2004	18.92	36.86	5.79	31.07	0.00	31.07
	4/29/2004	18.92	36.86	6.79	30.07	0.00	30.07
	7/30/2004	18.91	36.86	10.43	26.43	0.00	26.43
	11/2/2004	18.91	36.86	10.83	26.03	0.00	26.03
	1/30/2005	18.91	36.86	7.54	29.32	0.00	29.32
	4/14/2005	18.93	36.86	4.82	32.04	0.00	32.04

Corrected Adjusted Elevation =  
Adjusted Groundwater Elevation + ( Thickness of product x (density of product/density of water))  
Density of product = 0.73 g/mL (density of oil)  
Density of water = 1g/mL

**Table 1 (cont.)****Water Levels**

Crescent Shell

890 L Street

Crescent City, California 95531

Sample Location	Date	Depth to Bottom/ Feet BGS	Survey Height/ Feet Above MSL	Depth to Water/ Feet BGS	Adjusted Elevation/ Feet Above MSL	Thickness of Floating Product/ Feet	Corrected Adjusted Elevation/ feet Above MSL
MW-5	4/22/2003	18.83	37.27	6.17	31.10	----	----
	5/22/2003	18.87	37.27	7.60	29.67	0.01	29.68
	6/26/2003	18.83	37.27	9.46	27.81	SHEEN	----
	7/22/2003	18.83	37.27	10.31	26.96	SHEEN	----
	8/25/2003	18.83	37.27	11.17	26.10	0.00	26.10
	9/22/2003	18.83	37.27	11.71	25.56	0.00	25.56
	10/23/2003	18.83	37.27	12.26	25.01	0.00	25.01
	11/25/2003	18.83	37.27	12.77	24.50	0.00	24.50
	12/16/2003	18.83	37.27	8.09	29.18	0.00	29.18
	1/23/2004	18.83	37.27	6.53	30.74	0.00	30.74
	2/24/2004	18.83	37.27	4.39	32.88	0.00	32.88
	3/26/2004	18.83	37.27	6.41	30.86	0.00	30.86
	4/29/2004	18.83	37.27	7.55	29.72	0.00	29.72
	7/30/2004	18.81	37.27	11.18	26.09	0.00	26.09
	11/2/2004	18.86	37.27	11.48	25.79	0.00	25.79
MW-6	1/30/2005	18.79	37.27	8.26	29.01	0.00	29.01
	4/14/2005	18.78	37.27	5.51	31.76	0.00	31.76
	4/22/2003	18.74	37.80	7.35	30.45	----	----
	5/22/2003	18.69	37.80	8.73	29.07	SHEEN	----
	6/26/2003	18.74	37.80	10.48	27.32	0.00	27.32
	7/22/2003	18.74	37.80	11.31	26.49	0.00	26.5
	8/25/2003	18.74	37.80	12.13	25.67	0.00	25.67
	9/22/2003	18.74	37.80	12.67	25.13	0.00	25.13
	10/23/2003	18.74	37.80	13.18	24.62	0.00	24.62
	11/25/2003	18.74	37.80	12.66	25.14	0.00	25.14
	12/16/2003	18.74	37.80	8.42	29.38	0.00	29.38
	1/23/2004	18.74	37.80	7.71	30.09	0.00	30.09
	2/24/2004	18.74	37.80	5.24	32.56	0.00	32.56
	3/26/2004	18.74	37.80	7.15	30.65	0.00	30.65
	4/29/2004	18.74	37.80	8.60	29.20	0.00	29.20
MW-7	7/30/2004	18.69	37.80	12.14	25.66	0.00	25.66
	11/2/2004	18.63	37.80	12.37	25.43	0.00	25.43
	1/30/2005	18.70	37.80	9.26	28.54	0.00	28.54
	4/14/2005	18.68	37.80	6.51	31.29	0.00	31.29
	4/22/2003	18.31	36.88	4.3	32.57	----	----
	5/22/2003	18.30	36.88	5.95	30.93	0.00	30.93
	6/26/2003	18.31	36.88	8.29	28.59	0.00	28.59
	7/22/2003	18.31	36.88	9.29	27.59	0.00	27.59
	8/25/2003	18.31	36.88	10.23	26.65	0.00	26.65
	9/22/2003	18.31	36.88	10.81	26.07	0.00	26.07
	10/23/2003	18.31	36.88	11.38	25.50	0.00	25.50
	11/25/2003	18.31	36.88	10.84	26.04	0.00	26.04
	12/16/2003	18.31	36.88	6.75	30.13	0.00	30.13
	1/23/2004	18.31	36.88	4.80	32.08	0.00	32.08
	2/24/2004	18.31	36.88	2.65	34.23	0.00	34.23
MW-8	3/26/2004	18.31	36.88	4.59	32.29	0.00	32.29
	4/29/2004	18.31	36.88	5.93	30.95	0.00	30.95
	7/30/2004	18.30	36.88	10.21	26.67	0.00	26.67
	11/2/2004	18.22	36.88	10.53	26.35	0.00	26.35
	1/30/2005	18.31	36.88	6.84	30.04	0.00	30.04
	4/14/2005	18.23	36.88	3.76	33.12	0.00	33.12
MW-8	4/14/2005	14.20	37.88	7.32	30.56	0.00	30.56

Corrected Adjusted Elevation =

Adjusted Groundwater Elevation + ( Thickness of product x (density of product/density of water))

Density of product = 0.73 g/mL (density of oil)

Density of water = 1g/mL

**Table 2**  
**Groundwater Analytical Results**

Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Annual Event	Sample Event	Sample Date	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	Ethylbenzene (ppb)	MTBE (ppb)	DIPE (ppb)	TAME (ppb)	ETBE (ppb)	TBA (ppb)	TPHd (ppb)	TPHmo (ppb)
MW-1	Second Quarter	First Quarterly	5/6/2002	52,800	ND < 300	ND < 300	ND < 300	3,730	ND < 300	ND < 500	ND < 500	ND < 500	ND < 100,000	3,180	822
	Third Quarter	Second Quarterly	8/4/2002	10,400	ND < 60	ND < 60	859	5,000	ND < 400	ND < 100	ND < 100	ND < 100	ND < 20,000	4,670	ND < 50
	Fourth Quarter	Third Quarterly	11/6/2002	6,030	ND < 60	103	313	4,370	349	ND < 100	ND < 100	ND < 100	ND < 20,000	2,080	ND < 50
	First Quarter	Fourth Quarterly	2/7/2003	14,000	32	37	212	2,200	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	1,800	ND < 500
	Second Quarter	Well Installation	4/22/2003	13,000	ND < 50	ND < 50	190	1,900	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,000	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	920	11	40	266	1,100	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50	6,800	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	21,000	18	51	235	6,100	ND < 10	ND < 10	ND < 10	ND < 10	ND < 100	4,900	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	7,600	73	ND < 50	130	1,800	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	16,000	ND < 50	ND < 50	91	2,000	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,400	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	13,000	ND < 50	ND < 50	110	3,700	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	6,200	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	14,000	ND < 50	76	304	4,200	ND < 50	ND < 50	ND < 50	ND < 50	ND < 500	4,100	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	8,040	21.0	11.0	1,940	1,550	ND < 20.0	ND < 10.0	ND < 100	ND < 100	ND < 1,000	3,340	ND < 50
MW-2	Second Quarter	Twelfth Quarterly	4/14/2005	16,300	ND < 10	4,770	57.6	1,990	ND < 20.0	ND < 10.0	ND < 10.0	ND < 10.0	ND < 1,000	8,340	1,830
	Second Quarter	First Quarterly	5/6/2002	1,440	5.1	ND < 0.3	2.6	54	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	380	ND < 50
	Third Quarter	Second Quarterly	8/4/2002	1,280	96.6	4.4	11.8	433	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	1,300	ND < 50
	Fourth Quarter	Third Quarterly	11/6/2002	479	75.1	4.1	15	237	ND < 2.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 100	379	ND < 50
	First Quarter	Fourth Quarterly	2/7/2003	470	2.2	ND < 0.5	ND < 1	0.6	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	90	ND < 500
	Second Quarter	Well Installation	4/22/2003	740	2.0	ND < 0.5	ND < 1	5.7	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	270	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	2,000	11	1.8	10	120	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	530	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	3,100	180	7.8	22	770	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50	1,000	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	150	1.0	ND < 0.5	ND < 1	1.2	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	1,400	1.1	ND < 0.5	ND < 1	8.2	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	300	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	2,100	6.7	2.5	6.2	240	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	890	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	2,000	12	ND < 5	ND < 15	720	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 50.0	560	ND < 500
MW-4	First Quarter	Eleventh Quarterly	1/30/2005	566	0.5	ND < 0.5	ND < 1.0	0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50.0	218	ND < 50
	Second Quarter	Twelfth Quarterly	4/14/2005	10,300	ND < 5.0	5,100	12.1	5.7	ND < 10.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 500	128,000	39,800
	Second Quarter	Well Installation	4/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	0.7	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	78	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
	Second Quarter	Twelfth Quarterly	4/14/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	0.7	ND < 1.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 50	303	132

Notes:

TPHg: Total petroleum hydrocarbons as gasoline  
 TPHd: Total petroleum hydrocarbons as diesel  
 TPHmo: Total Petroleum hydrocarbons as motor oil  
 MTBE: Methyl tertiary butyl ether  
 TAME: Tertiary amyl methyl ether

TBA: Tertiary butanol  
 DIPE: Diisopropyl ether  
 ETBE: Ethyl tertiary butyl ether  
 ppb: parts per billion = µg/l = 1,000 mg/l = 0.001 ppm.  
 ND: Not detected at or above the method detection limit as shown.

**Table 2**  
**Groundwater Analytical Results**  
Crescent Shell  
890 L Street  
Crescent City, California 95531

Sample Location	Annual Event	Sample Event	Sample Date	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	Ethylbenzene (ppb)	MTBE (ppb)	DIPE (ppb)	TAME (ppb)	ETBE (ppb)	TBA (ppb)	TPHd (ppb)	TPHmo (ppb)
MW-5	Second Quarter	Well Installation	4/22/2003	<b>4,800</b>	<b>98</b>	<b>20</b>	<b>530</b>	<b>86</b>	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	ND < 5.0	<b>1,500</b>	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	<b>130</b>	<b>5.3</b>	ND < 0.5	<b>4.4</b>	<b>7.2</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	<b>130</b>	<b>22</b>	ND < 0.5	<b>2.6</b>	<b>13</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	<b>170</b>	<b>3.9</b>	ND < 0.5	ND < 0.5	<b>3.2</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	<b>270</b>	<b>34</b>	<b>1.4</b>	<b>32.7</b>	<b>15</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	<b>73</b>	<b>11</b>	ND < 0.5	<b>2.2</b>	<b>11</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	<b>140</b>	<b>26</b>	<b>0.5</b>	<b>13.0</b>	<b>25</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	<b>75.4</b>	<b>9.1</b>	<b>0.6</b>	<b>6.3</b>	<b>9.1</b>	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
	Second Quarter	Twelfth Quarterly	4/14/2005	<b>19,200</b>	<b>5.2</b>	<b>9,270</b>	<b>13.2</b>	<b>3.8</b>	ND < 5.0	ND < 2.5	ND < 2.5	ND < 2.5	ND < 250	<b>23,300</b>	<b>7,290</b>
MW-6	Second Quarter	Well Installation	4/22/2003	<b>82</b>	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 5.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	<b>0.7</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
	Second Quarter	Twelfth Quarterly	4/14/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 50	<b>183</b>	<b>94</b>
MW-7	Second Quarter	Well Installation	4/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Fifth Quarterly	7/22/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Sixth Quarterly	10/23/2003	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Seventh Quarterly	1/23/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Second Quarter	Eighth Quarterly	4/29/2004	<b>75</b>	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Third Quarter	Ninth Quarterly	7/30/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	Fourth Quarter	Tenth Quarterly	11/2/2004	ND < 50	ND < 0.5	ND < 0.5	ND < 1.5	<b>0.5</b>	ND < 0.5	ND < 0.5	ND < 0.5	ND < 0.5	ND < 5.0	ND < 50	ND < 500
	First Quarter	Eleventh Quarterly	1/30/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 5.0	ND < 5.0	ND < 50	ND < 50	ND < 50
	Second Quarter	Twelfth Quarterly	4/14/2005	ND < 50	ND < 0.5	ND < 0.5	ND < 1.0	ND < 0.5	ND < 1.0	ND < 0.5	ND < 0.5	ND < 0.5	ND < 50	<b>150</b>	<b>140</b>
MW-8	Second Quarter	Twelfth Quarterly	4/14/2005	<b>5,710</b>	<b>785</b>	<b>614</b>	<b>653</b>	<b>680</b>	ND < 12.5	ND < 6.2	ND < 6.2	ND < 6.2	ND < 625	<b>40,600</b>	<b>12,300</b>

Notes:

TPHg: Total petroleum hydrocarbons as gasoline

MTBE: Methyl tertiary butyl ether

DIPE: Diisopropyl ether

TAME: Tertiary amyl methyl ether

ETBE: Ethyl tertiary butyl ether

TBA: Tertiary butanol

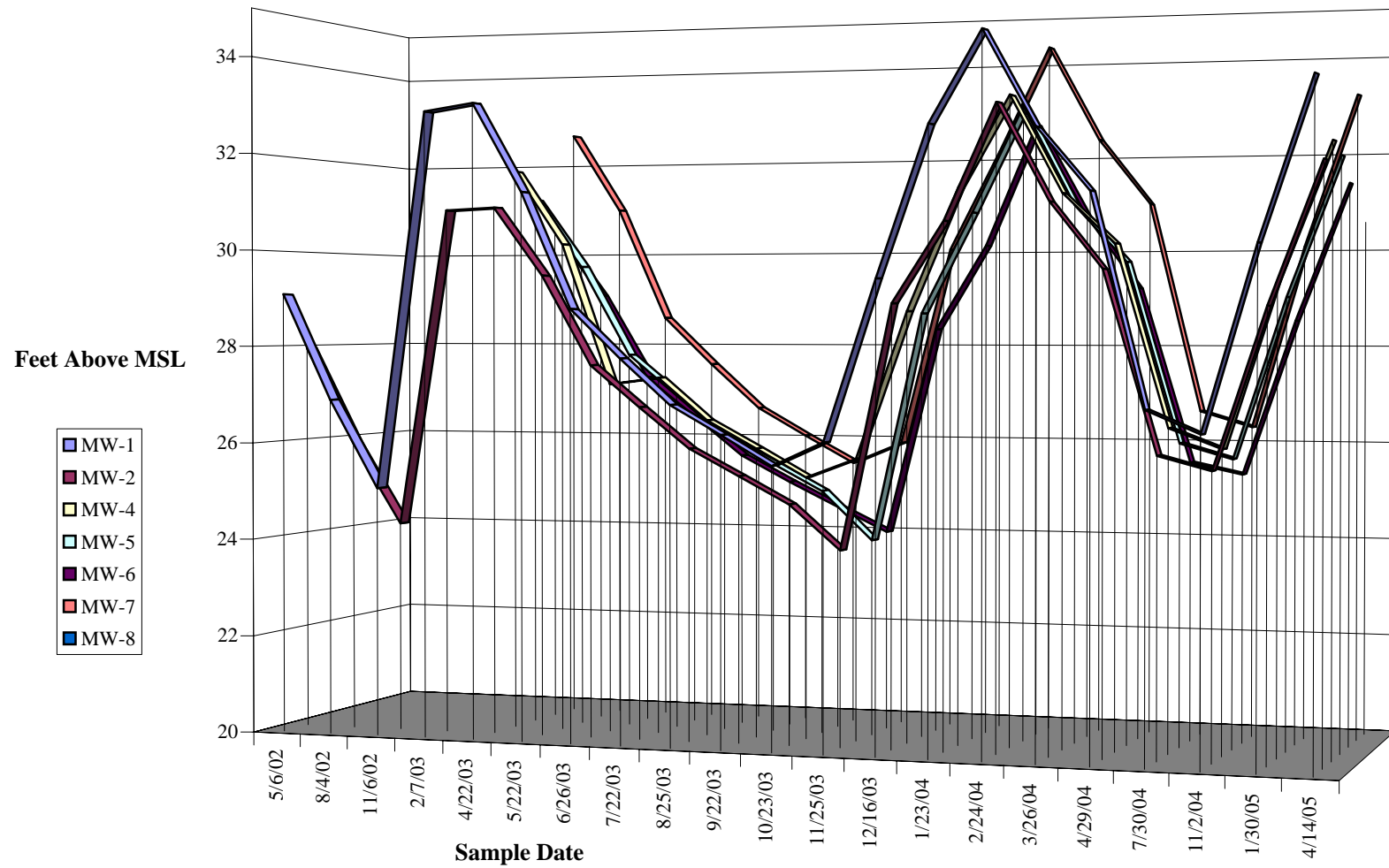
TPHd: Total petroleum hydrocarbons as diesel

TPHmo: Total Petroleum hydrocarbons as motor oil

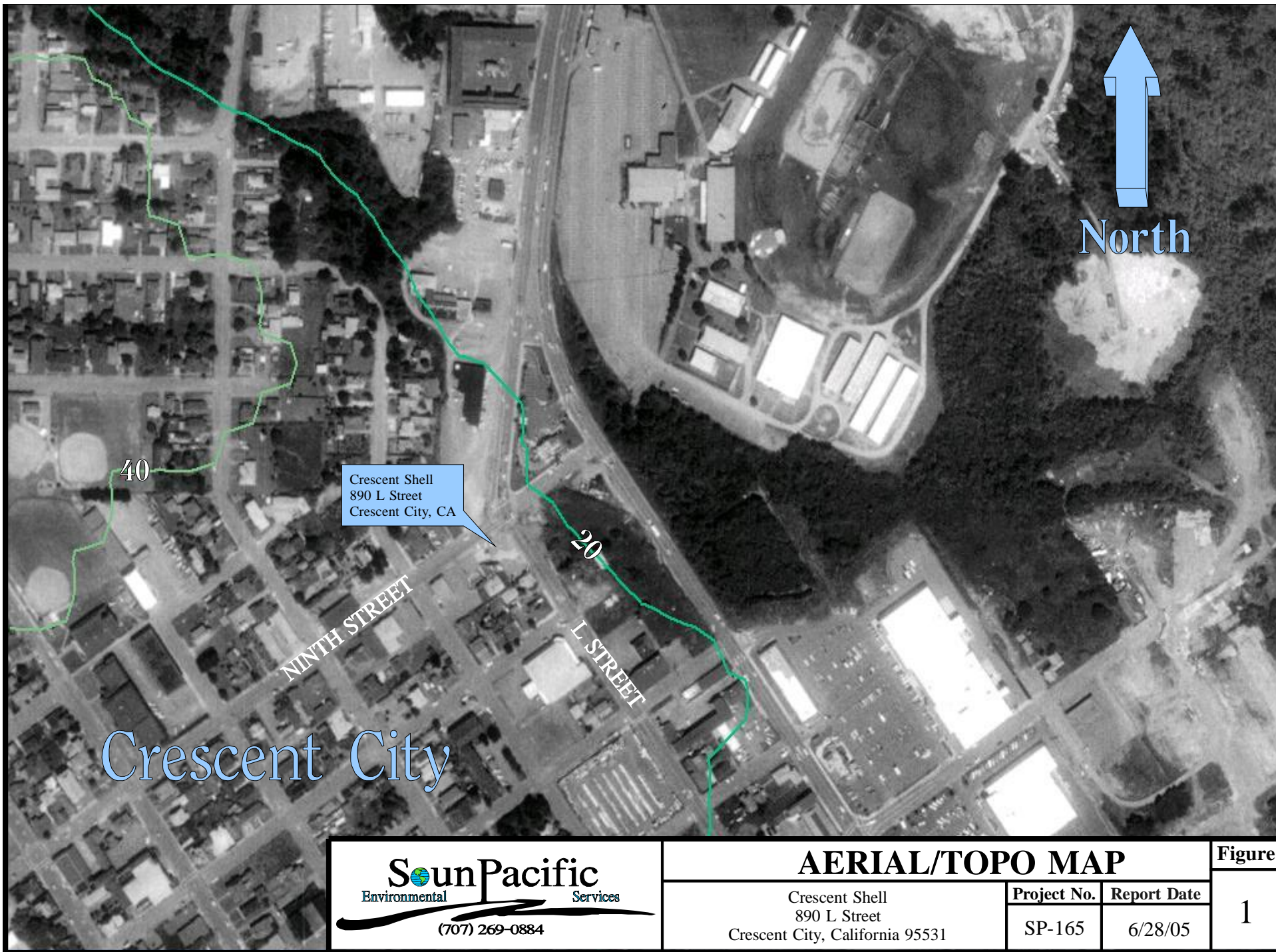
ppb: parts per billion = µg/l = 1,000 mg/l = 0.001 ppm.

ND: Not detected at or above the method detection limit as shown.

**Chart 1**  
**Monthly Hydrograph**  
Crescent Shell  
890 L Street  
Crescent City, California 95531



# Figures



**SounPacific**  
Environmental Services  
(707) 269-0884

AERIAL/TOPO MAP			Figure
Crescent Shell 890 L Street Crescent City, California 95531	Project No.	Report Date	1
	SP-165	6/28/05	



NORTH

L STREET

Sign

MW-4

Sign

MW-5

W

MW-6

Traffic Pole

← PL

MW-2

Previous Pump Islands

Storm Drain

Storm Drain

MW-1

Previously Removed 4,000-gallon Unleaded Gasoline UST

(3) Previously Removed 5,000-gallon Unleaded Gasoline USTs

MW-7

Excavation Limits

RESIDENTIAL PROPERTIES

## LEGEND



Monitoring Well



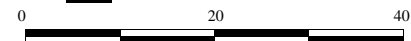
Traffic Control Box



Sewer Valve



Water Valve



APPROXIMATE SCALE IN FEET

Poles

Gas Valve

Propane Tank

SKAGG'S AUTO REPAIR

## SITE PLAN

Figure

Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.

Report Date

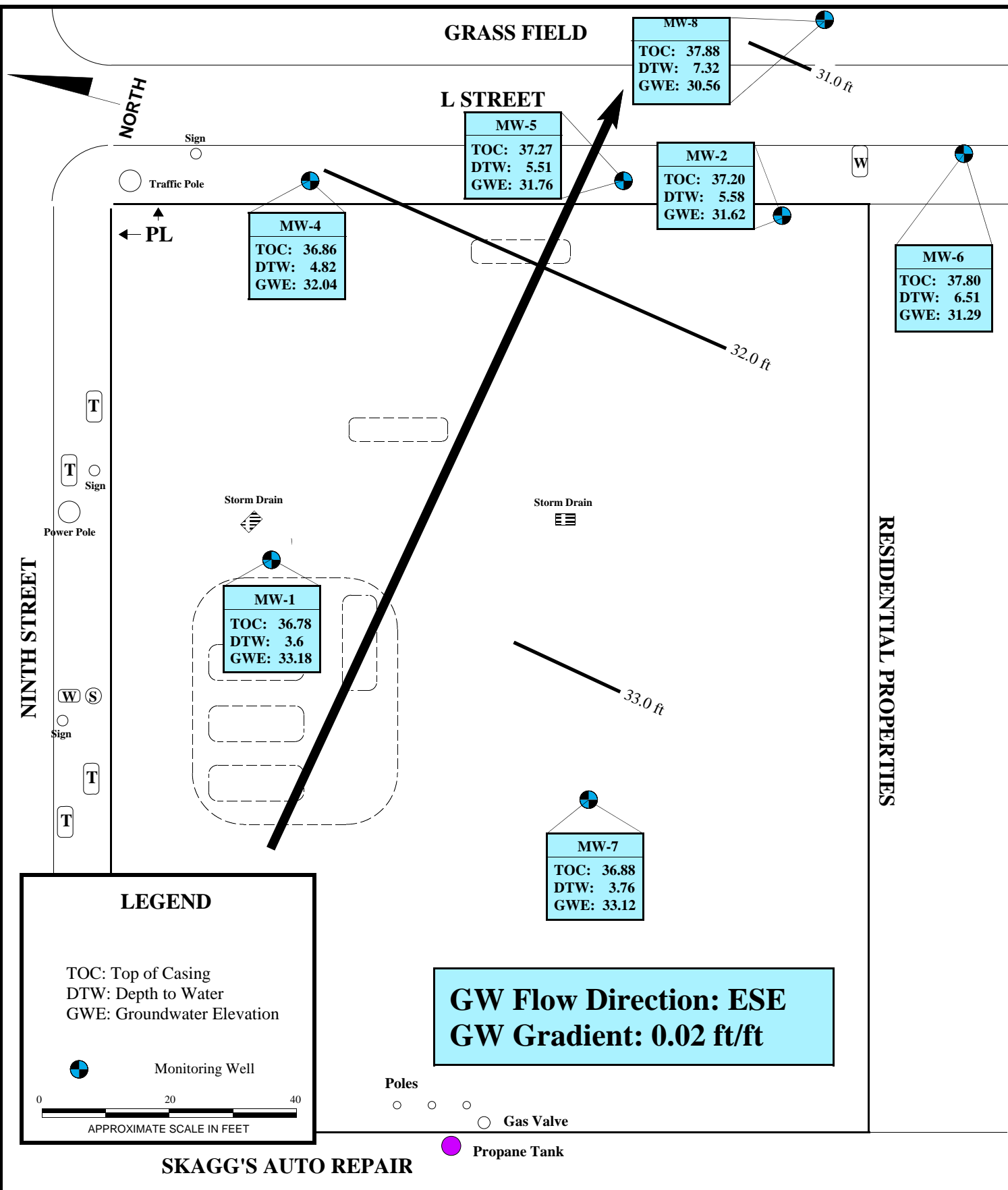
SP-165

6/28/05

2

Environmental

Services



## GROUNDWATER GRADIENT MAP

### APRIL 2005

Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.

SP-165

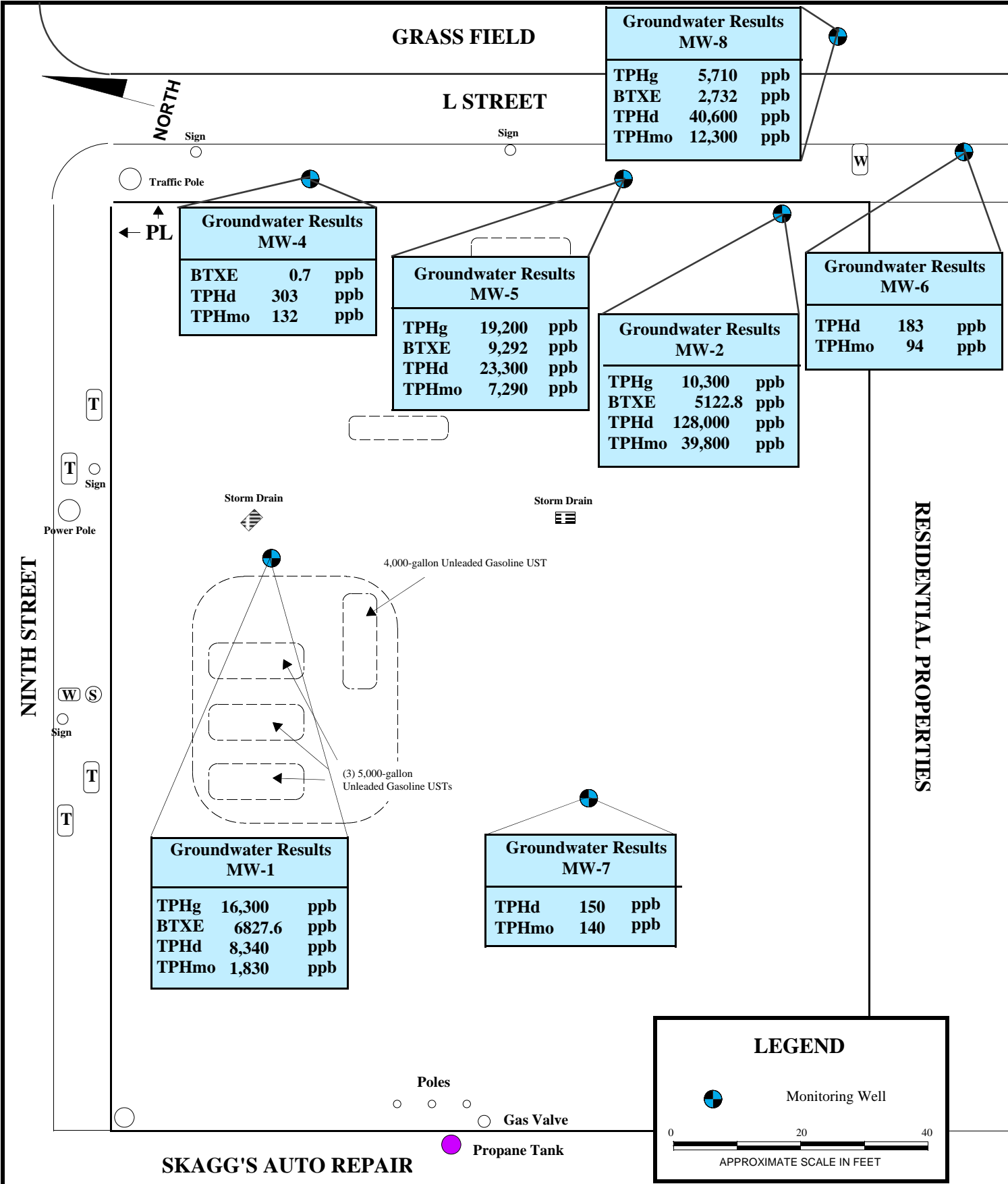
Report Date

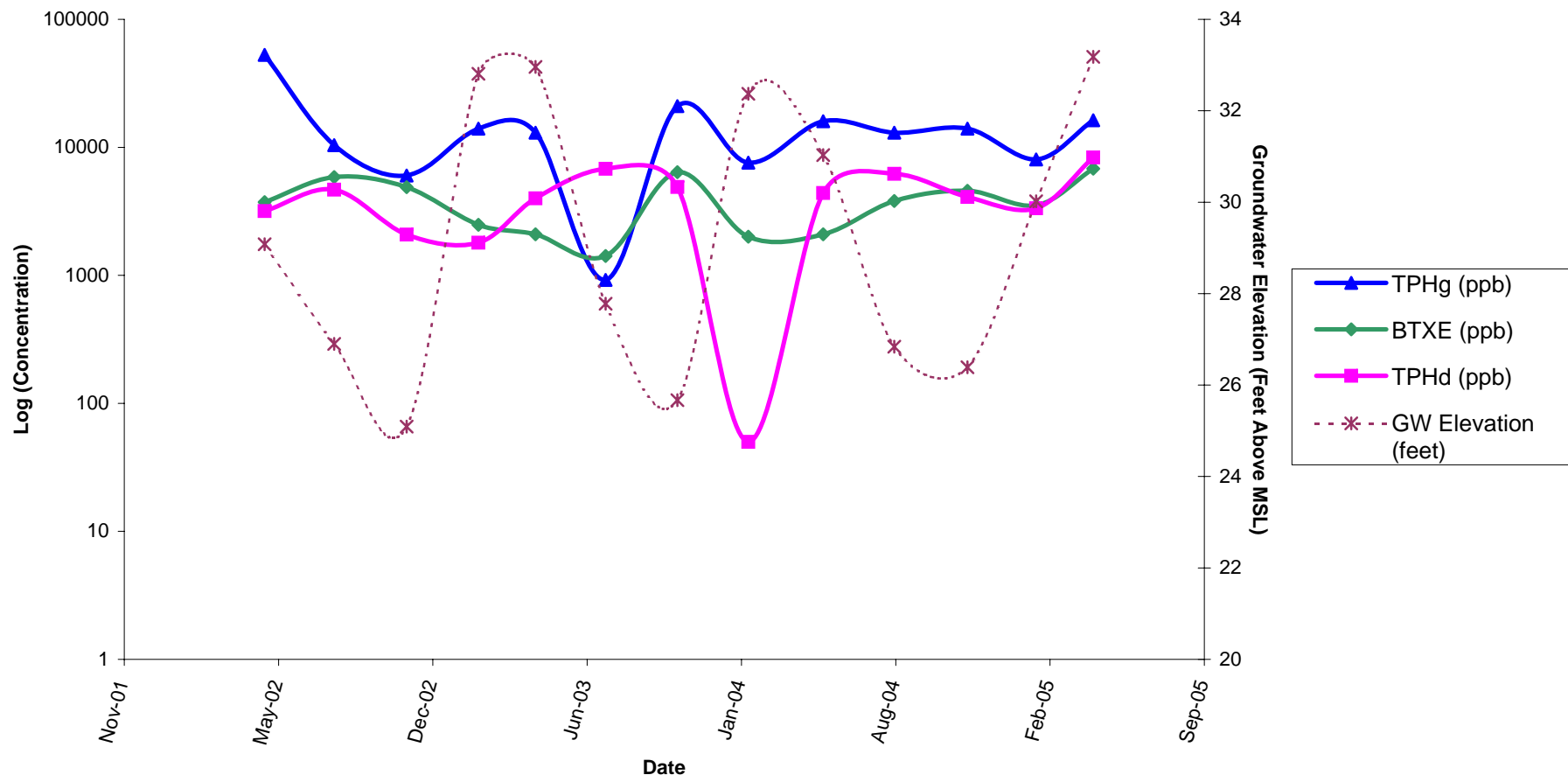
6/28/05

Figure

3







### MW-1 HYDROCARBON CONCENTRATIONS VS. TIME

Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.

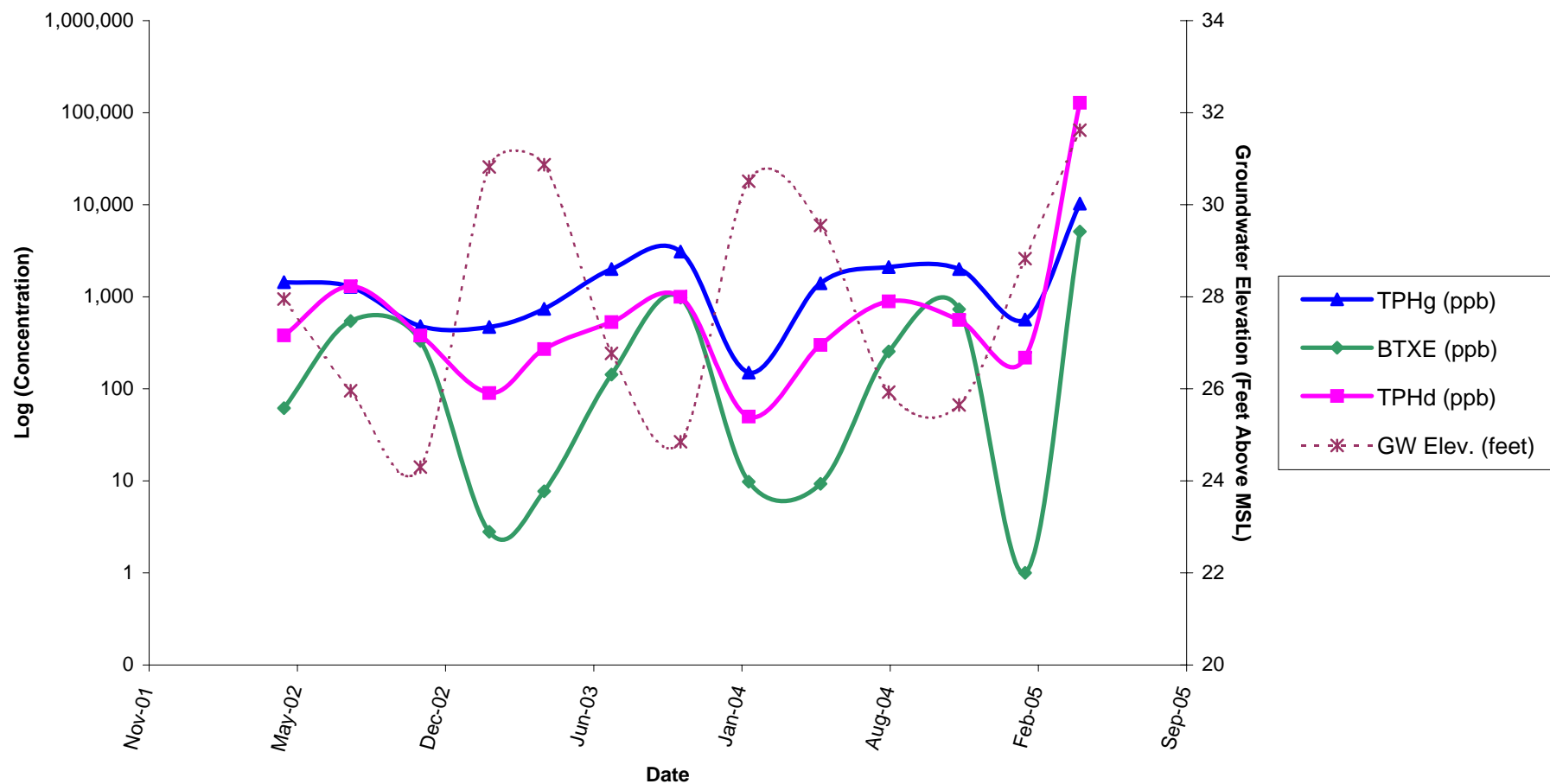
SP-165

Date

6/28/2005

Figure

5



**SounPacific**  
Environmental Services  
(707) 269-0884

### MW-2 HYDROCARBON CONCENTRATIONS VS. TIME

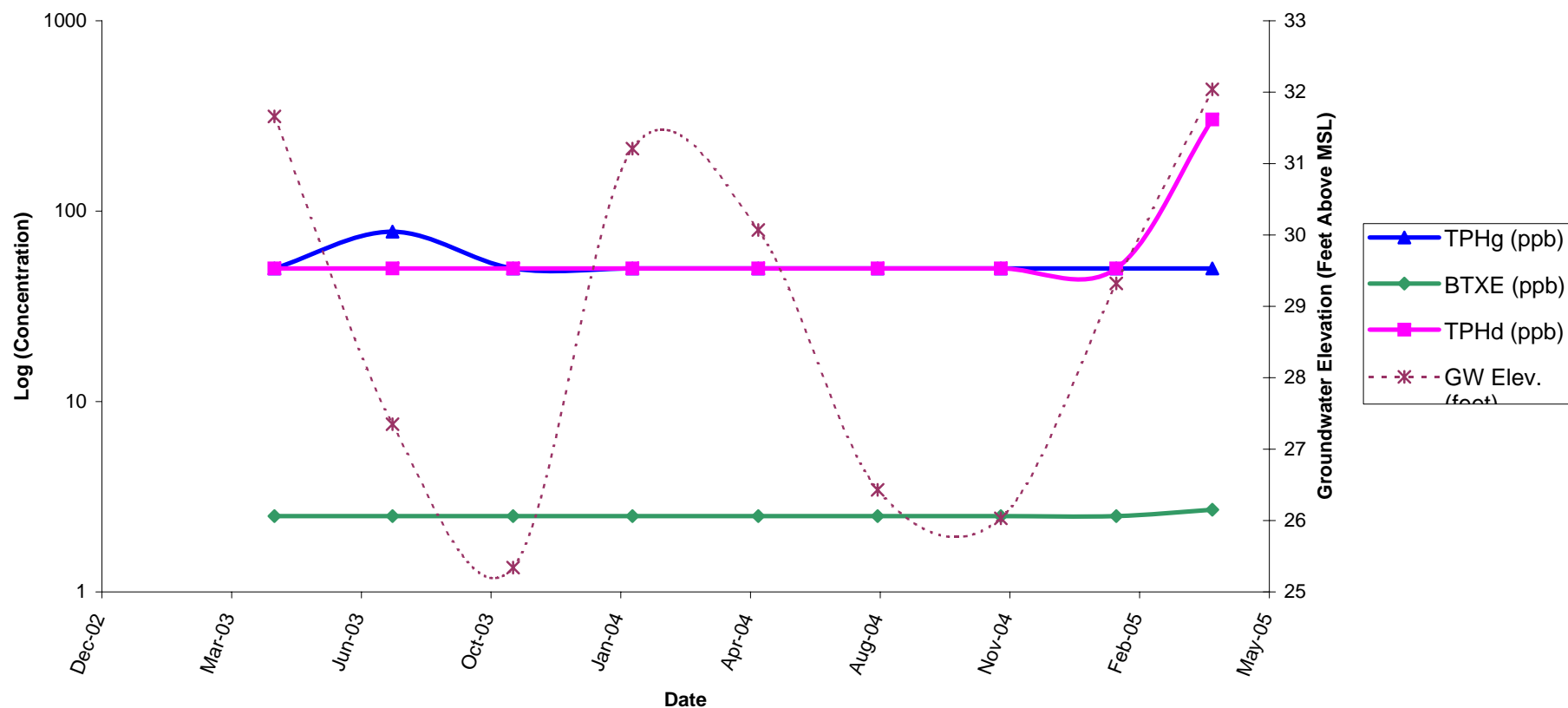
Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.  
SP-165

Date  
6/28/2005

Figure

6



**SounPacific**  
 Environmental Services  
 (707) 269-0884

### MW-4 HYDROCARBON CONCENTRATIONS VS. TIME

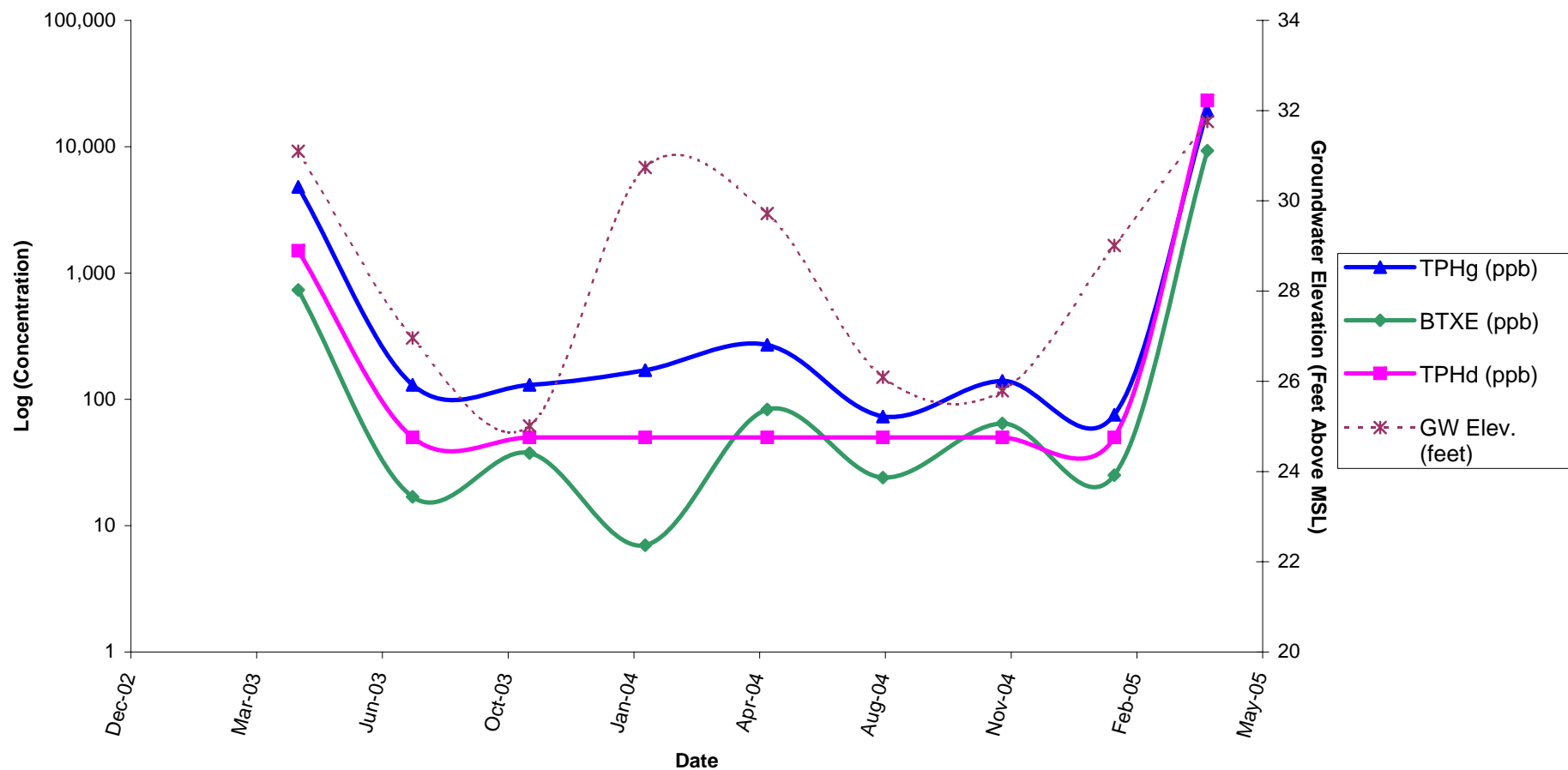
Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.  
 SP-165

Date  
 6/28/2005

Figure

7



**MW-5 HYDROCARBON  
 CONCENTRATIONS VS. TIME**

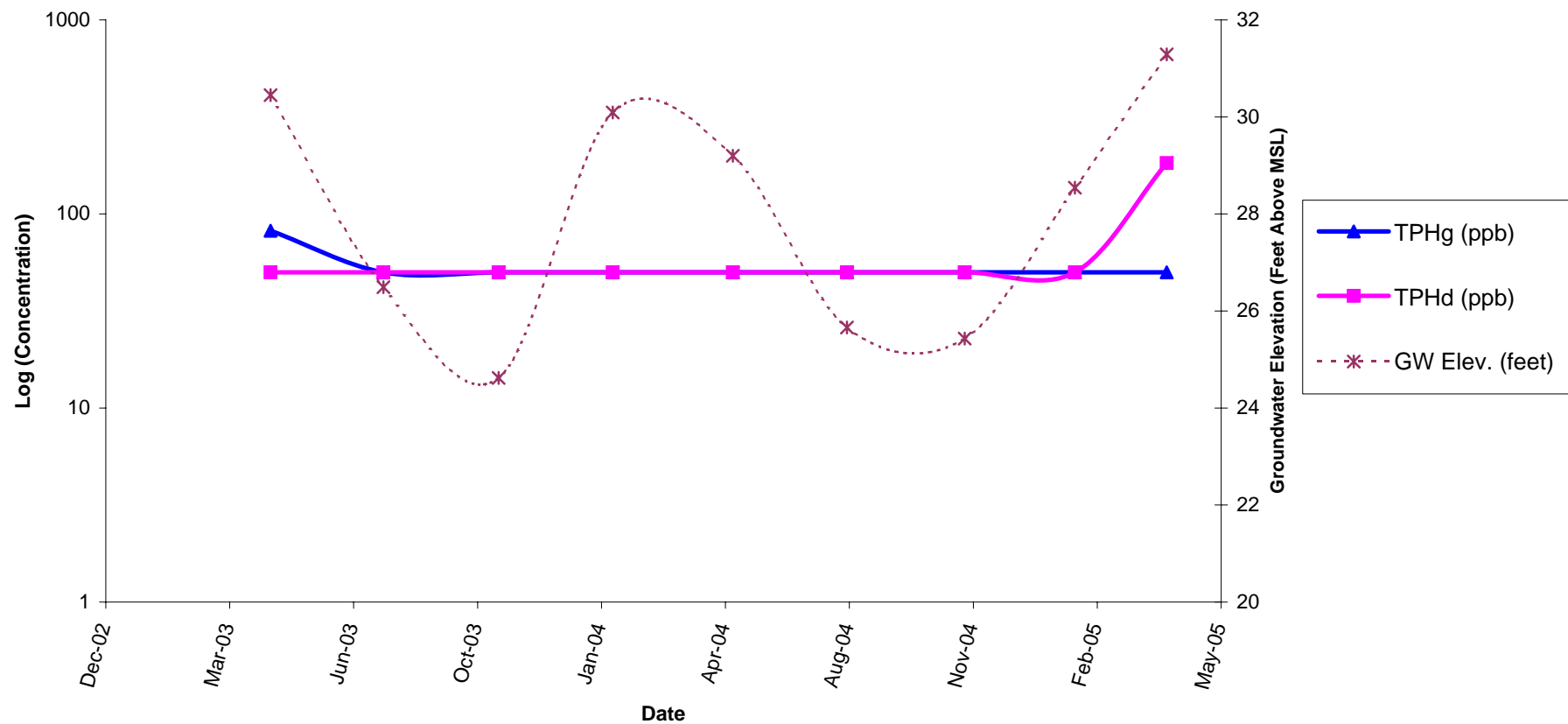
Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.  
 SP-165

Date  
 6/28/2005

Figure

8



**MW-6 HYDROCARBON  
 CONCENTRATIONS VS. TIME**

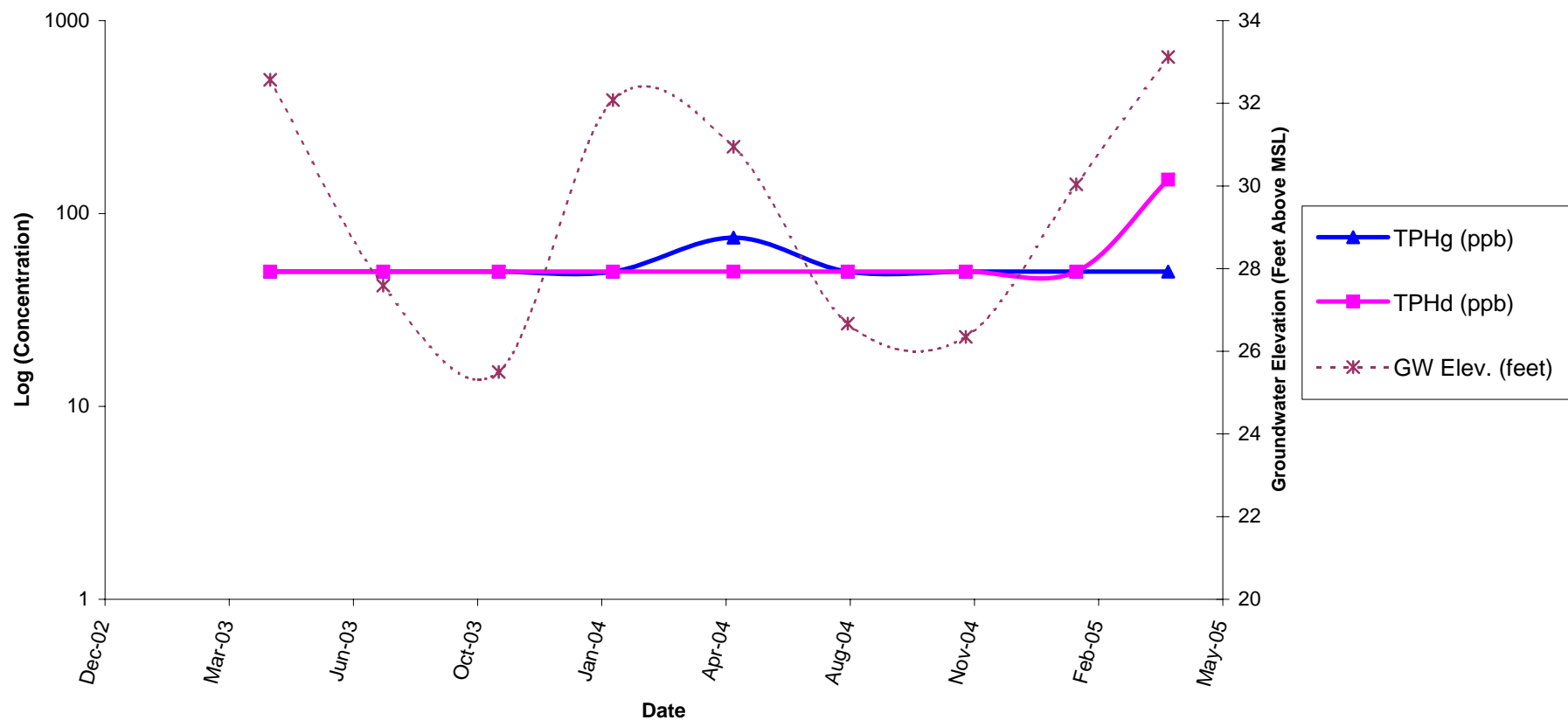
Crescent Shell  
 890 L Street  
 Crescent City, California 95531

Project No.  
 SP-165

Date  
 6/28/2005

Figure

9



**MW-7 HYDROCARBON  
CONCENTRATIONS VS. TIME**

Crescent Shell  
890 L Street  
Crescent City, California 95531

Project No.  
SP-165

Date  
6/28/2005

Figure

10

# Appendices

# Appendix A

May 02, 2005

**Lab ID: 5040673**

Tien-yu Tai  
SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549  
RE: CRESCENT SHELL SP-165

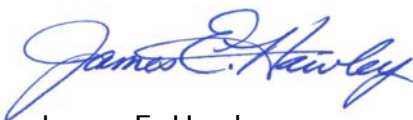
Dear Tien-yu Tai,

Enclosed are the analysis results for Work Order number 5040673. All analysis were performed under strict adherence to our established Quality Assurance Plan. Any abnormalities are listed in the qualifier section of this report.

If you have any questions regarding these results, please feel free to contact us at any time. We appreciate the opportunity to service your environmental testing needs.

Sincerely,

For



James E. Hawley  
Laboratory Director

California ELAP Certification Number 1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: Tien-yu Tai

Project: CRESCENT SHELL SP-165

Description: MW-1

Matrix: Water

Lab ID: 5040673-01

Lab No: 5040673  
Reported: 05/02/05  
Phone: 707-269-0884  
P.O. #

Sampled: 04/14/05 00:00

Received: 04/19/05 12:00

## Volatile Organic Compounds

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	16300			1000	EPA 8015/8260	04/19/05	04/19/05	B5D0456
Benzene	"	ND			10.0	"	"	"	"
Ethylbenzene	"	1990			100	"	04/20/05	"	"
Toluene	"	4770			100	"	"	"	"
Xylenes (total)	"	57.6			20.0	"	04/19/05	"	"
Methyl tert-butyl ether	"	ND			20.0	"	"	"	"
Di-isopropyl ether	"	ND			10.0	"	"	"	"
Tert-amyl methyl ether	"	ND			10.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			10.0	"	"	"	"
Tert-butyl alcohol	"	ND			1000	"	"	"	"
Surrogate: 4-Bromofluorobenzene		114 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	8340	D-01, QM-4X, QR-03		100	EPA 8015 MOD	04/27/05	04/20/05	B5D0465
Motor Oil	"	1830	D-10, QM-4X, QR-03		100	"	"	"	"
Surrogate: Octacosane		106 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: Tien-yu Tai

Project: CRESCENT SHELL SP-165

Description: MW-2

Matrix: Water

Lab ID: 5040673-02

Lab No: 5040673  
Reported: 05/02/05  
Phone: 707-269-0884  
P.O. #

Sampled: 04/14/05 00:00

Received: 04/19/05 12:00

## Volatile Organic Compounds

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	10300			2500	EPA 8015/8260	04/20/05	04/19/05	B5D0456
Benzene	"	ND			5.0	"	04/19/05	"	"
Ethylbenzene	"	5.7			5.0	"	"	"	"
Toluene	"	5100			50.0	"	04/20/05	"	"
Xylenes (total)	"	12.1			10.0	"	04/19/05	"	"
Methyl tert-butyl ether	"	ND			10.0	"	"	"	"
Di-isopropyl ether	"	ND			5.0	"	"	"	"
Tert-amyl methyl ether	"	ND			5.0	"	"	"	"
Ethyl tert-butyl ether	"	ND			5.0	"	"	"	"
Tert-butyl alcohol	"	ND			500	"	"	"	"
Surrogate: 4-Bromofluorobenzene		108 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	128000	QM-4X, QR-03		2500	EPA 8015 MOD	04/27/05	04/20/05	B5D0465
Motor Oil	"	39800	D-10, QM-4X, QR-03		2500	"	"	"	"
Surrogate: Octacosane		%	S-01		50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

**Attention:** Tien-yu Tai

**Project:** CRESCENT SHELL SP-165

**Description:** MW-4

**Matrix:** Water

**Lab ID:** 5040673-03

**Lab No:** 5040673  
**Reported:** 05/02/05  
**Phone:** 707-269-0884  
**P.O. #**

**Sampled:** 04/14/05 00:00

**Received:** 04/19/05 12:00

## Volatile Organic Compounds

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Gasoline	ug/l	ND			50.0	EPA 8015/8260	04/19/05	04/19/05	B5D0456
Benzene	"	ND			0.5	"	"	"	"
<b>Ethylbenzene</b>	"	<b>0.7</b>			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			0.5	"	"	"	"
Ethyl tert-butyl ether	"	ND			0.5	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
<i>Surrogate: 4-Bromofluorobenzene</i>		<i>111 %</i>			<i>43-155</i>	"	"	"	"

## TPH Diesel & Motor Oil

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
<b>Diesel</b>	ug/l	<b>303</b>	QM-4X, QR-03		50	EPA 8015 MOD	04/22/05	04/20/05	B5D0465
<b>Motor Oil</b>	"	<b>132</b>	QM-4X, QR-03		50	"	"	"	"
<i>Surrogate: Octacosane</i>		<i>101 %</i>			<i>50-150</i>	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: Tien-yu Tai

Project: CRESCENT SHELL SP-165

Description: MW-5

Matrix: Water

Lab ID: 5040673-04

Lab No: 5040673  
Reported: 05/02/05  
Phone: 707-269-0884  
P.O. #

Sampled: 04/14/05 00:00

Received: 04/19/05 12:00

## Volatile Organic Compounds

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	19200			3120	EPA 8015/8260	04/20/05	04/19/05	B5D0456
Benzene	"	5.2			2.5	"	04/19/05	"	"
Ethylbenzene	"	3.8			2.5	"	"	"	"
Toluene	"	9270			125	"	04/20/05	"	"
Xylenes (total)	"	13.2			5.0	"	04/19/05	"	"
Methyl tert-butyl ether	"	ND			5.0	"	"	"	"
Di-isopropyl ether	"	ND			2.5	"	"	"	"
Tert-amyl methyl ether	"	ND			2.5	"	"	"	"
Ethyl tert-butyl ether	"	ND			2.5	"	"	"	"
Tert-butyl alcohol	"	ND			250	"	"	"	"
Surrogate: 4-Bromofluorobenzene		108 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	23300	QM-4X, QR-03		500	EPA 8015 MOD	04/27/05	04/20/05	B5D0465
Motor Oil	"	7290	D-10, QM-4X, QR-03		500	"	"	"	"
Surrogate: Octacosane		115 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

**Attention:** Tien-yu Tai

**Project:** CRESCENT SHELL SP-165

**Description:** MW-6

**Matrix:** Water

**Lab ID:** 5040673-05

**Lab No:** 5040673  
**Reported:** 05/02/05  
**Phone:** 707-269-0884  
**P.O. #**

**Sampled:** 04/14/05 00:00

**Received:** 04/19/05 12:00

## Volatile Organic Compounds

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Gasoline	ug/l	ND			50.0	EPA 8015/8260	04/19/05	04/19/05	B5D0456
Benzene	"	ND			0.5	"	"	"	"
Ethylbenzene	"	ND			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			0.5	"	"	"	"
Ethyl tert-butyl ether	"	ND			0.5	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
<i>Surrogate: 4-Bromofluorobenzene</i>		106 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Diesel	ug/l	183	QM-4X, QR-03		50	EPA 8015 MOD	04/22/05	04/20/05	B5D0465
Motor Oil	"	94	QM-4X, QR-03		50	"	"	"	"
<i>Surrogate: Octacosane</i>		104 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

**Attention:** Tien-yu Tai

**Project:** CRESCENT SHELL SP-165

**Description:** MW-7

**Matrix:** Water

**Lab ID:** 5040673-06

**Lab No:** 5040673  
**Reported:** 05/02/05  
**Phone:** 707-269-0884  
**P.O. #**

**Sampled:** 04/14/05 00:00

**Received:** 04/19/05 12:00

## Volatile Organic Compounds

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Gasoline	ug/l	ND			50.0	EPA 8015/8260	04/19/05	04/19/05	B5D0456
Benzene	"	ND			0.5	"	"	"	"
Ethylbenzene	"	ND			0.5	"	"	"	"
Toluene	"	ND			0.5	"	"	"	"
Xylenes (total)	"	ND			1.0	"	"	"	"
Methyl tert-butyl ether	"	ND			1.0	"	"	"	"
Di-isopropyl ether	"	ND			0.5	"	"	"	"
Tert-amyl methyl ether	"	ND			0.5	"	"	"	"
Ethyl tert-butyl ether	"	ND			0.5	"	"	"	"
Tert-butyl alcohol	"	ND			50.0	"	"	"	"
<i>Surrogate: 4-Bromofluorobenzene</i>		105 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

<u>Analyte</u>	<u>Units</u>	<u>Results</u>	<u>Qualifier</u>	<u>MDL</u>	<u>RL</u>	<u>Method</u>	<u>Analyzed</u>	<u>Prepared</u>	<u>Batch</u>
Diesel	ug/l	150	QM-4X, QR-03		50	EPA 8015 MOD	04/22/05	04/20/05	B5D0465
Motor Oil	"	140	QM-4X, QR-03		50	"	"	"	"
<i>Surrogate: Octacosane</i>		96.3 %			50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

Report To: SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549

Attention: Tien-yu Tai

Project: CRESCENT SHELL SP-165

Description: MW-8

Matrix: Water

Lab ID: 5040673-07

Lab No: 5040673  
Reported: 05/02/05  
Phone: 707-269-0884  
P.O. #

Sampled: 04/14/05 00:00

Received: 04/19/05 12:00

## Volatile Organic Compounds

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Gasoline	ug/l	5710			625	EPA 8015/8260	04/20/05	04/20/05	B5D0456
Benzene	"	785			6.2	"	"	"	"
Ethylbenzene	"	680			6.2	"	"	"	"
Toluene	"	614			6.2	"	"	"	"
Xylenes (total)	"	653			12.5	"	"	"	"
Methyl tert-butyl ether	"	ND			12.5	"	"	"	"
Di-isopropyl ether	"	ND			6.2	"	"	"	"
Tert-amyl methyl ether	"	ND			6.2	"	"	"	"
Ethyl tert-butyl ether	"	ND			6.2	"	"	"	"
Tert-butyl alcohol	"	ND			625	"	"	"	"
Surrogate: 4-Bromofluorobenzene		110 %			43-155	"	"	"	"

## TPH Diesel & Motor Oil

Analyte	Units	Results	Qualifier	MDL	RL	Method	Analyzed	Prepared	Batch
Diesel	ug/l	40600	QM-4X, QR-03		1000	EPA 8015 MOD	04/22/05	04/20/05	B5D0465
Motor Oil	"	12300	QM-4X, QR-03		1000	"	"	"	"
Surrogate: Octacosane		%	S-01		50-150	"	"	"	"

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

**Report To:** SOUNPACIFIC  
4612 GREENWOOD HEIGHTS DR  
KNEELAND, CA 95549  
**Attention:** Tien-yu Tai  
**Project:** CRESCENT SHELL SP-165

**Lab No:** 5040673  
**Reported:** 05/02/05  
**Phone:** 707-269-0884  
**P.O. #**

### Notes and Definitions

D-01 This sample appears to contain volatile range organics.  
D-10 The heavy oil range organics present are due to hydrocarbons eluting primarily in the diesel range.  
QM-4X The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to the analyte concentration being greater than 4 times the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.  
QR-03 The RPD value for the sample duplicate or MS/MSD was outside of the QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.  
S-01 The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.  
DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the detection limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference  
< Less than reporting limit  
≤ Less than or equal to reporting limit  
> Greater than reporting limit  
≥ Greater than or equal to reporting limit  
MDL Method Detection Limit  
RL/ML Minimum Level of Quantitation  
MCL/AL Maximum Contaminant Level/Action Level  
mg/kg Results reported as wet weight  
TTLC Total Threshold Limit Concentration  
STLC Soluble Threshold Limit Concentration  
TCLP Toxicity Characteristic Leachate Procedure

---

Approved By

Basic Laboratory, Inc.

California D.O.H.S. Cert #1677

2218 Railroad Avenue, Redding, CA 96001 (530) 243-7234 FAX 243-7494

<b>CLIENT NAME:</b> SounPacific		<b>PROJECT NAME:</b> Crescent Shell		<b>PROJECT #:</b> SP-165		<b>LAB #:</b> 5040673	
<b>ADDRESS:</b> PO BOX 13 Kneeland, CA 95549		<b>REQUESTED COMP. DATE:</b> STD 5/3/05				<b># SAMP:</b> 7 35 in	
<b>PROJECT MANAGER:</b> Tien-yu Tai		<b>TURN AROUND TIME:</b>		STD <input checked="" type="checkbox"/> RUSH <input type="checkbox"/>		<b>PAGE</b> 1 <b>OF</b> 1	
<b>PHONE:</b> (707)-269-0884		<b>FAX:</b> (707) 269-0699		<b>E-MAIL:</b> Tien@SounPacific.com			
<b>INVOICE TO:</b> SounPacific		<b>PO#:</b>					
<b>SPECIAL MAIL</b> <input type="checkbox"/>		<b>E-MAIL</b> <input checked="" type="checkbox"/>		<b>FAX</b> <input type="checkbox"/>			
DATE	TIME	WATER	COMP	SOIL	SAMPLE DESCRIPTION		REMARKS
4-14-05		X			T0601500049 * <del>Well Installation Sampling</del>		1 EDT
					Mw - 1	V X	2 Needed
					Mw - 2		3
					Mw - 4		4
					Mw - 5		5
					Mw - 6		6
					Mw - 7		7
					Mw - 8		

**ANALYSES REQUESTED**

REP.	I.D.#	SYSTEM #:	CUST. SEAL	ICE	QC = 1 2 3 4

# OF BOTTLES

Poly, Trig, Tetra,  
BTXE, SOXYS

---

**PRESERVATIONS**   HNO<sub>3</sub> ☐   H<sub>2</sub>SO<sub>4</sub> ☐   NaOH ☐   ZnAc/AcNaOH ☐   HCL ☒   Nathio ☐

<b>SAMPLED BY:</b> Tien-yu Tai	<b>DATE/TIME:</b> 4-14-05	<b>RELINQUISHED BY:</b> Tien-yu Tai	<b>DATE/TIME:</b> 4-15-05
<b>RECEIVED BY:</b>	<b>DATE/TIME:</b>	<b>RELINQUISHED BY:</b>	<b>DATE/TIME:</b>
<b>VED BY:</b>	<b>DATE/TIME:</b>	<b>RELINQUISHED BY:</b>	<b>DATE/TIME:</b>
<b>RECEIVED BY LAB:</b> Norma Dahl	<b>DATE/TIME:</b> 4/19/05 12:00	<b>SAMPLE SHIPPED VIA:</b> UPS POST BUS FED-EX OTHER _____	

INSTRUCTIONS, TERMS, CONDITIONS ON BACK

## **Appendix B**



# Standard Operating Procedures

## Monitoring Well Purging and Groundwater Sampling

All SounPacific employees and contractors shall adopt the following procedures any time that groundwater samples are to be taken from an existing groundwater monitoring well.

Prior to the implementation of these procedures, the groundwater level **MUST** be measured and the presence of free phase hydrocarbons determined in accordance with SounPacific's Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements.

### Equipment Checklist

- ☐ Gauging Data / Purge Calculations Sheet used for water level determination
- ☐ Chain of Custody Form
- ☐ pH/ Conductivity / Temperature meter
- ☐ Pencil or Pen
- ☐ Indelible Marker
- ☐ Calculator
- ☐ Disposable Gloves
- ☐ Distilled Water
- ☐ Alconox/liquinox liquid or powdered non-phosphate cleaner
- ☐ Buckets or Tubs for decontamination station
- ☐ Bottom-filling bailer or pumping device for purging
- ☐ Disposable bottom-filling bailer and emptying device for sampling
- ☐ String, twine or fishing line for bailers
- ☐ Sample containers appropriate for intended analytical method (check with lab)
- ☐ Sample labels
- ☐ Site Safety Plan
- ☐ Tools necessary to access wells
- ☐ Drum space on site adequate for sampling event

### **Procedure**

1. Review Site Safety Plan and utilize personal protection appropriate for the contaminants that may be encountered.
2. Measure groundwater levels and check for the presence of free product in accordance with the Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements.

### **Purging**

3. Calculate and record the volume of standing water in each well using the information provided on the Gauging Data / Purge Calculations sheet.  
 $(DTB-DTW) \times \text{Conversion Factor} = \text{Casing Volume}.$
4. The purge volume shall be at least three times and no more than seven times the volume of standing water (the casing volume).
5. Purge the well by bailing or pumping water from the well into a calibrated receptacle, such as a five gallon bucket or tub with markings to indicate one gallon increments. Collect purgeate in a 55 gallon labeled drum and store on site. Drum labels should include the date, contents, site number, and SounPacific's name and telephone number.
6. Take measurements of pH, conductivity, temperature, and visual observations to verify the stabilization of these parameters. At least five measurements of these parameters should be made throughout the purging process. The parameters shall be considered stabilized if successive measurements vary by less than 0.25 pH units, 10% of conductivity in  $\mu\text{S}$ , and  $1^{\circ}\text{C}$  (or  $1.8^{\circ}\text{F}$ ). Continue purging until at least three times the casing volume has been removed, and the measured parameters have stabilized as indicated above. Do not exceed seven casing volumes.
7. Take a final depth to groundwater measurement and calculate the casing volume of the recharged well. Ideally, the casing volume should have recharged to at least 80% of the original measured casing volume before sampling commences. If due to slow recharge rates it is not feasible to wait for the well to fully recharge, then note this on the Gauging Data / Purge Calculation Sheet and proceed to sample following the procedure below.

## **Sampling**

8. **After completing groundwater measurement, and checking for free product if necessary, in accordance with SounPacific's Standard Operating Procedures for Groundwater Level Measurements and Free Phase Hydrocarbon Measurements, and after purging monitoring wells as described above, groundwater samples may be collected.**
9. Slowly lower a clean, previously unused disposable bailer into the well water approximately half of the bailer length, and allow the bailer to slowly fill.
10. Withdraw the full bailer from the monitoring well and utilize the included (clean and unused) bottom-emptying device to fill the necessary sample containers, and seal the container with the included PTFE (Teflon) lined cap.
11. When filling VOAs, fill the VOA completely full, with the meniscus rising above the rim of the bottle. Carefully cap the VOA and invert it and gently tap it to determine whether air bubbles are trapped inside. If the VOA contains air bubbles, refill the VOA and repeat this step.
12. All samples shall be labeled with the Sample ID, the Sample Date, and the Sample Location or Project Number. Use an indelible marker for writing on sample labels.
13. Record all pertinent sample data on the Chain of Custody.
14. Place samples in an ice chest cooled to 4°C with ice or "blue ice". Bottles should be wrapped in bubble wrap, and VOA's should be inserted in a foam VOA holder to protect against breakage. Samples are to be kept at 4°C until delivered to the laboratory. Any transference of sample custody shall be indicated on the Chain of Custody with the appropriate signatures as necessary.
15. Utilize clean, previously unused gloves, bailer and line, and bottom-emptying device for each well sampled.
16. When finished with all sampling, close and secure all monitoring wells.
17. Leave the site cleaner than when you arrived and drive safely.



## **Standard Operating Procedures**

### **Groundwater Level Measurements and Free Phase Hydrocarbon Measurements**

All SounPacific staff and contractors shall adopt the following procedures any time that groundwater elevations are determined for the purposes of establishing groundwater gradient and direction, and prior to any sampling event.

Wells are to be tested for free phase hydrocarbons (free product) before the first development or sampling of any new well, and in any well that has historically contained free product.

#### **Equipment Checklist**

- ☐ Combination water level / free phase hydrocarbon indicator probe (probe)
- ☐ Gauging Data / Purge Calculations Sheet
- ☐ Pencil or Pen/sharpie
- ☐ Disposable Gloves
- ☐ Distilled Water and or know water source on site that is clean
- ☐ Alconox (powder) or Liquinox (liquid) non-phosphate cleaners—do not use soap!
- ☐ Buckets or Tubs for decontamination station
- ☐ Tools necessary to access wells
- ☐ Site Safety Plan
- ☐ This Standard Operating Procedure
- ☐ Notify Job site business that you will be arriving to conduct work.

#### **Procedure**

1. Review Site Safety Plan and utilize personal protection appropriate for the contaminants that may be encountered.
2. Access and open all monitoring wells to be measured. Allow wells to equilibrate for approximately 15 minutes before taking any measurements.

3. Decontaminate probe with Alconox or Liquinox solution, and rinse with distilled water.
4. Determine the diameter of the well to be measured and indicate this on the Gauging Data / Purge Calculations Sheet.
5. Words of caution: Please be careful with water level and product meters probes are not attached with high strength material so please make sure to avoid catching the end on anything in the well and make sure not to wind reel to the point that it could pull on the probe. ***If product is suspect in a well, go to step 6, if no product is suspected go to step 7 below.***
6. **When product is present or suspected:** use the product level meter. Clip the static charge clamp to the side of the well casing. Then lower probe into the well through the product/water interface about one foot if possible. Then slowly raise the probe back up through the product/water interface layer and record the level as the tone changes from solid to broken-record this level in the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTP). Continue to raise the probe up through the product until the tone stops completely-record this level on the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTW). Then go to step 8.
7. **When no product is present or suspected:** If no free product is present, record the depth of the water (to the nearest 0.01 foot) relative to the painted black mark on the top of the well casing. Leave the probe in the well just a hair above the water level to ensure the well as equilibrated. As the well rises, the tone will sound. Make sure no increase in water levels have occurred in over a ten-minute period. Water levels can lower as well as rise. Make sure you note when the level you keep lowering the probe to has remained stable for at least ten minutes. Once this has been accomplished, please record this level in the Gauging Data / Purge Calculations Sheet to the nearest 0.01 foot (DTW).
8. Turn off the probe, and use the probe to determine the depth to the bottom of the well relative to the top of the well casing. This is the depth to bottom measurement (DTB).
9. Decontaminate probe and tape by washing in an Alconox/Liquinox solution (***read directions on solution for ratio of water to cleanser***) and use the toothbrush provided to remove any foreign substance from the probe and tape. Then triple rinse probe and tape with clean water and then proceed to take measurements in the next well.
10. If sampling is to occur, proceed to implement SounPacific's Standard Operating Procedure for Monitoring Well Purging and Sampling. If no sampling is to be performed, close and secure all wells and caps.

# Appendix C

## GAUGING DATA/PURGE CALCULATIONS

Job Site:

Crescent Shell

Job No.:

SP165

Event:

Well Installation

Date:

4-8-05

**Soun Pacific**  
Environmental Services  
(707) 269-0884

Well No.	DIA (in.)	DTB (ft.)	DTW (ft.)	ST (ft.)	CV (gal.)	PV (gal.)	SPL (ft.)	Boiler Loads	Notes
MW-1	2	13.37	3.60	9.79	1.57	4.7			
MW-2	2	13.77	5.58	8.19	1.31	3.93			
MW-4	2	18.9	4.82	14.11	2.26	6.78			
MW-5	2	18.78	5.51	13.68	2.2	6.6			
MW-6	2	18.63	6.51	12.17	1.95	5.84			
MW-7	2	18.23	3.76	14.47	2.32	6.96			
MW-8	2	14.20	7.32	6.88	1.1	3.3			

## Explanation:

DIA = Well Diameter

DTB = Depth to Bottom

DTW = Depth to Water

ST = Stagnant Thickness (DTB-DTW)

CV = Casing Volume (ST x cf)

PV = Purge Volume (standard 3 x CV, well development 10 x CV)

SPL = Thickness of Separate Phase Liquid

## Conversion Factors (cf):

2 in. dia. well cf = 0.16 gal./ft.

4 in. dia. well cf = 0.65 gal./ft.

6 in. dia. well cf = 1.1 gal./ft.

Sampler:

Tian-yu Tu

FILE



# Well Gauging/Sampling Report

Sheet 1 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-1

Analyses Tested: TPHg, TPHd, TPHmo

Sample Containers: 3 - ViAs, 2 - 1-L Bottles

Purge Technique: ☐ Bailer ☒ Pump

Sounder Used: ☐ Water Meter ☐ Interface Meter

## Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:38	3.61 ft		Shreen
1:05	3.60 ft		Shreen
End			

## Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (mc/cm)	DO (mg/L)	DO (%)	
3:42P	1.57	7.11	58.30	0.610	0.69	6.8	
3:47P	1.57	6.77	58.27	0.607	0.52	5.2	
3:50P	3.14	7.02	58.67	0.660	0.47	4.8	
3:55P	4.71	6.74	58.72	0.637	0.30	3.0	

Field Scientist:

*Tien-yu Tam*

## Well Gauging/Sampling Report

Sheet 2 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW2

Analyses Tested: TPHg, THd, TTHmo, BTXE, SOxy

Sample Containers: 3 JAs (HIL), 2 1L Bales

Purge Technique: ☐ Bailor ☒ Pump

Sounder Used: ☐ Water Meter ☐ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12.46	5.58 ft		No Sheen
1.26	5.58		Sheen
End			

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ms/cm)	DO (mg/L)	DO (%)	
5:22p	0	7.08	57.38	0.262	1.11	10.8	
5:25p	1.31	7.19	57.94	0.249	0.57	5.5	
5:28p	2.62	7.18	58.08	0.241	0.49	4.8	
5:31p	3.93	7.15	58.11	0.244	0.48	4.7	

Field Scientist: Tien-yu Tai

**Well Gauging/Sampling Report**

Sheet 3 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-4

Analyses Tested: TPHg, TPHd, TPHmo, BTXE, Soxys

Sample Containers: 3 Hic Vials, 2 IL Bottles

Purge Technique: ☐ Bailor ☒ Pump  
Sonder Used: ☐ Water Meter ☐ Interface Meter

**Water & Free Product Levels**

Time	Depth to Water	Depth to Product	Notes
12.41 P	4.82 ft		No sheen
1.18 P	4.82 ft		No sheen
End			

**Field Measurements**

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (ms/cm)	DO (mg/L)	DO (%)	
4.22P	0	7.62	60.47	0.177	0.66	6.6	
4.27P	2.26	7.56	59.96	0.178	0.71	7.1	
4.30P	4.56	7.60	59.98	0.177	0.69	6.9	
4.33P	6.78	7.59	60.02	0.177	0.55	6.5	

Field Scientist: Tien-yu Tai

## Well Gauging/Sampling Report

Sheet 4 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: 9165 Well Number: 17W-5

Analyses Tested: TPHg, TP Hd, TP Hw, BTXE, SOXys

Sample Containers: 3 HCL VOAs, 2 IL Bottles

Purge Technique: ☐ Bailor ☒ Pump

Sounder Used: ☐ Water Meter ☐ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:44P	5.51		Sheen Det.
1:22P	5.51		Sheen
End			

### Field Measurements

Time	Total Vol. Removed(gal)	pH	Temp(F)	Cond.(ms/cm)	DO(mg/L)	DO(%)	
4:52P	0	7.51	58.70	0.178	0.54	5.3	
4:56P	2.2	7.47	59.45	0.192	0.42	4.2	
4:59P	4.4	7.41	59.53	0.193	0.44	4.4	
5:03P	6.6	7.31	59.59	0.196	0.31	3.1	

Field Scientist:

Tien-yu Tai

## Well Gauging/Sampling Report

Sheet 5 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: SP-165 Well Number: MW-6

Analyses Tested: TPHg, TPHd, TPHme, BTXE, 5-oxys

Sample Containers: 3 HIL VOAs, 2 IL Bottles

Purge Technique: ☐ Bailor ☒ Pump  
Sounding Used: ☐ Water Meter ☐ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12.52P	6.51ft		No Sheen
1.32P	6.51ft		No Sheen
End			

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (mc/cm)	DO (mg/L)	DO (%)	
5:46P	0	7.44	55.69	0.103	13.9	1.45	
5:51P	1.95	7.46	56.29	0.108	10.3	1.08	
5:54P	3.80	7.43	56.41	0.115	10.0	1.04	
5:58P	5.75	7.40	56.49	0.116	9.9	1.03	

Field Scientist: \_\_\_\_\_

## Well Gauging/Sampling Report

Sheet 6 of 7

Date: 4-14-05 Project Name: Crescent Shell Project No: SP165 Well Number: MW-7

Analyses Tested: TPH<sub>g</sub>, TPH<sub>d</sub>, TPH<sub>h</sub>, BTEX, 5<sub>vs</sub>

Sample Containers: 3 HCL VOA's, 2 IL-Bottle

Purge Technique: ☐ Bailor ☒ Pump

Sounder Used: ☐ Water Meter ☐ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes
12:30P	<del>3.75</del> ft		No Sheen
1:00P	3.76 ft		No Sheen
End			

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond (ns/cm)	DO (mg/L)	DO (%)	
3:04P	0	7.70	56.56	0.147	2.21	21.3	
3:10P	2.32	7.49	56.47	0.167	1.21	11.6	
3:13	4.64	7.39	56.56	0.175	1.12	10.8	
3:19	6.96	7.30	56.75	0.178	1.06	10.2	

Field Scientist: Tien-yu Tai

## Well Gauging/Sampling Report

Sheet 7 of 7

Date: 4-10-05 Project Name: Crescent Shell Project No: SP-165 Well Number: 14W-8

Analysis Tests: TAH, TPTH, TPTHw, BTXE, 5 Oxy's.

Sample Containers: 3 HIL Vials, 2 IL - Bottles

Purge Technique: ☐ Bailor ☒ Pump

Sounder Used: ☐ Water Meter ☐ Interface Meter

### Water & Free Product Levels

Time	Depth to Water	Depth to Product	Notes:
12:56 P.	7.33 ft		No Sheen
1:40 P.	7.32 ft		Sheen
End			

### Field Measurements

Time	Total Vol. Removed (gal)	pH	Temp (F)	Cond. (mc/cm)	DO (mg/L)	DO (%)	
6:17 P	0	7.24	56.38	0.187	0.83	8.0	
6:22 P	1.1	7.47	57.14	0.269	0.75	7.3	
6:24 P	2.2	7.68	57.17	0.263	0.72	7.0	
6:26 P	3.9	7.88	57.25	0.286	0.68	6.6	

Field Scientist: Tien-yu Tu